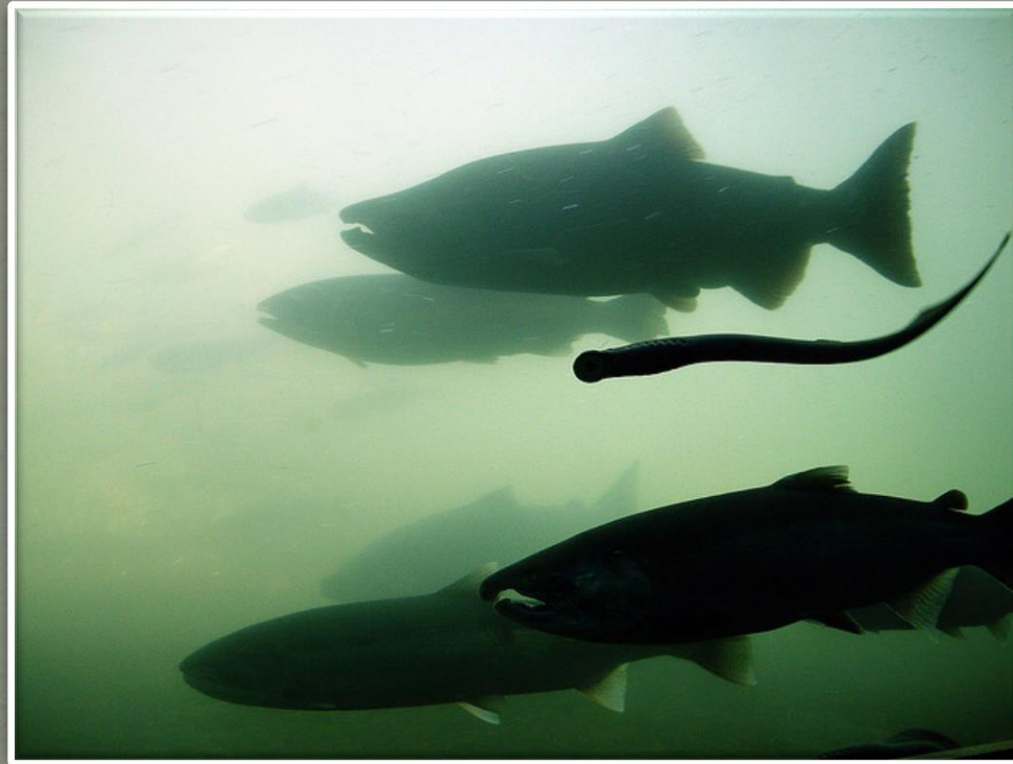


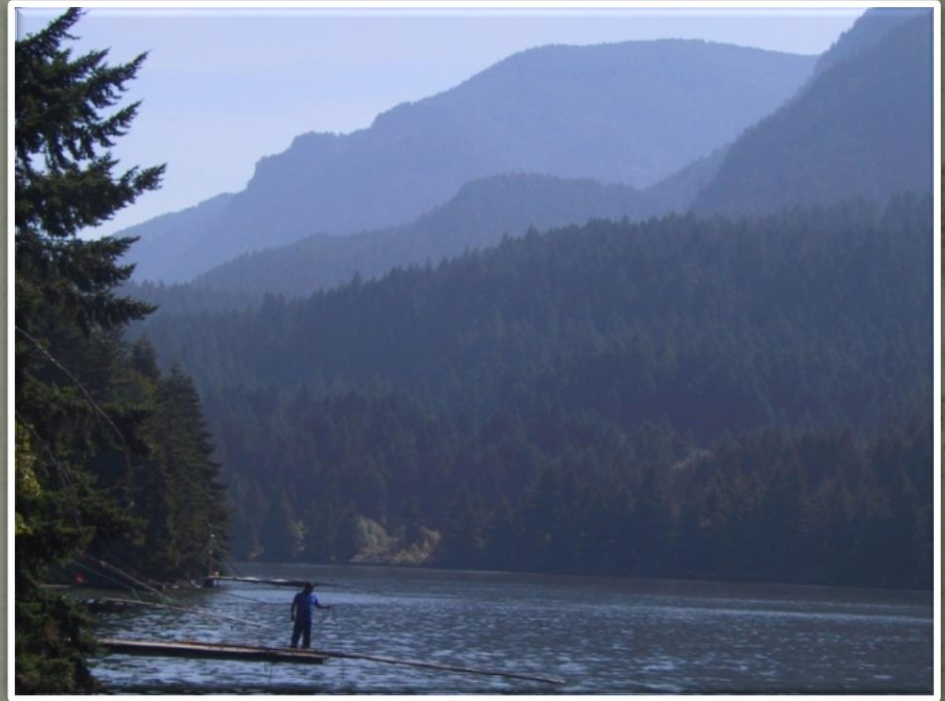
Genetic Estimation of Stock Abundance and Run-timing of Interior Columbia River Steelhead Passing Bonneville Dam



Jon E. Hess, John Whiteaker, Jeff Fryer, and
Shawn R. Narum

Genetic tagging & monitoring of steelhead stocks at Bonneville Dam

- Genetic tools
- Sampling at Bonneville
- Steelhead (2012)-
 - abundance estimates
 - run-timing
 - length/age attributes
- Concluding remarks



Genetic tools

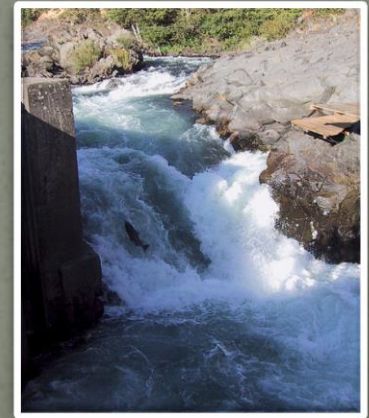
1) Parentage Based Tagging (PBT):

- Baseline of hatchery broodstock genetic data
- Identify all offspring of hatchery parents
- Data obtained similar to CWT but improved tagging rate (~100%)
- No juveniles have to be handled or injected with physical tags



2) Genetic Stock Identification (GSI):

- Baseline of population genetic data
- Identify the most likely population origin of hatchery and wild fish



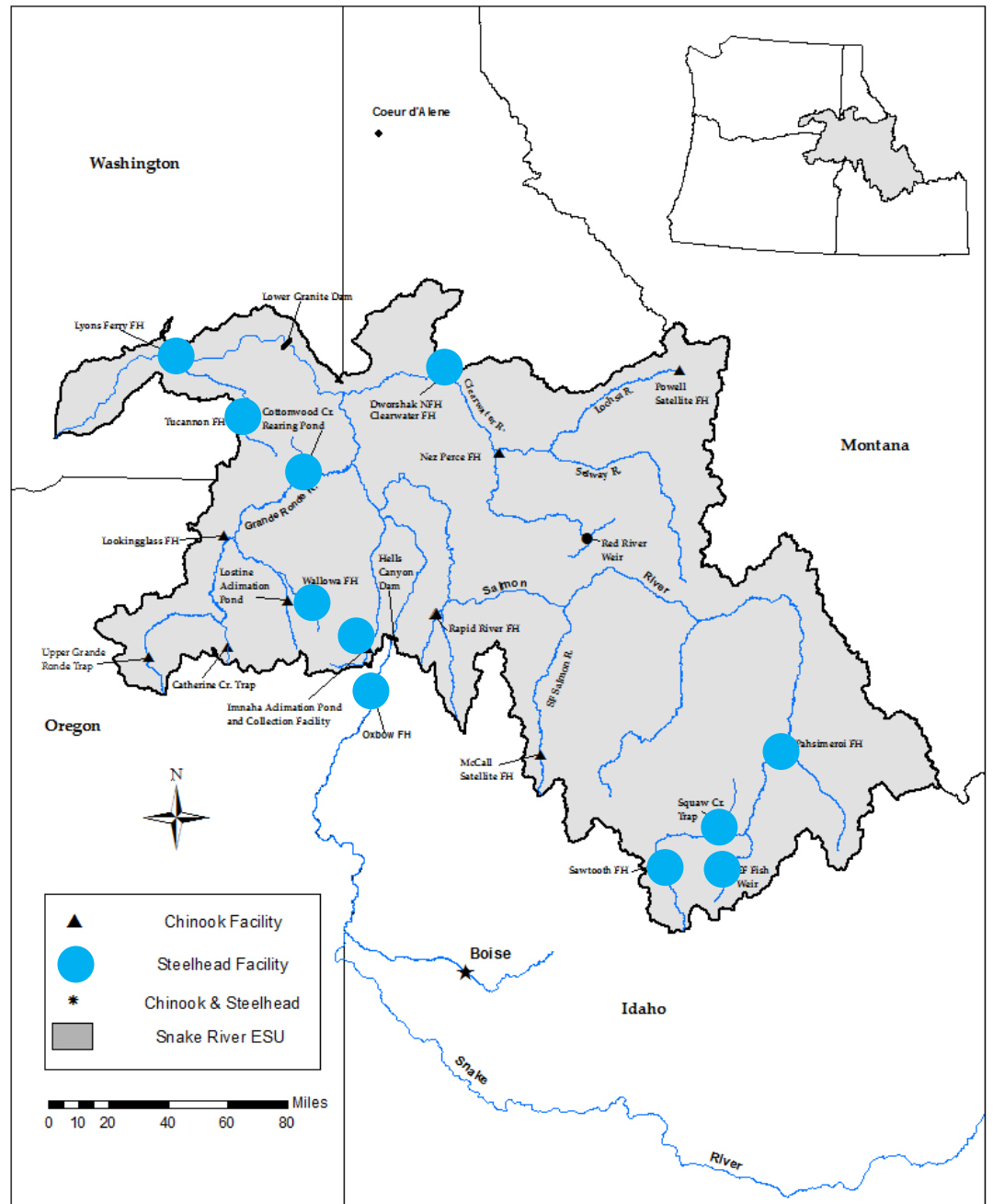
Genetic tools- PBT

Snake River Steelhead

- Majority sampled in 2008
- All broodstock sampled since 2009



Steele et al. 2011. Parentage Based Tagging of Snake River hatchery steelhead and Chinook salmon. Bonneville Power Administration. Annual Progress Report, Project number 2010-031-00.



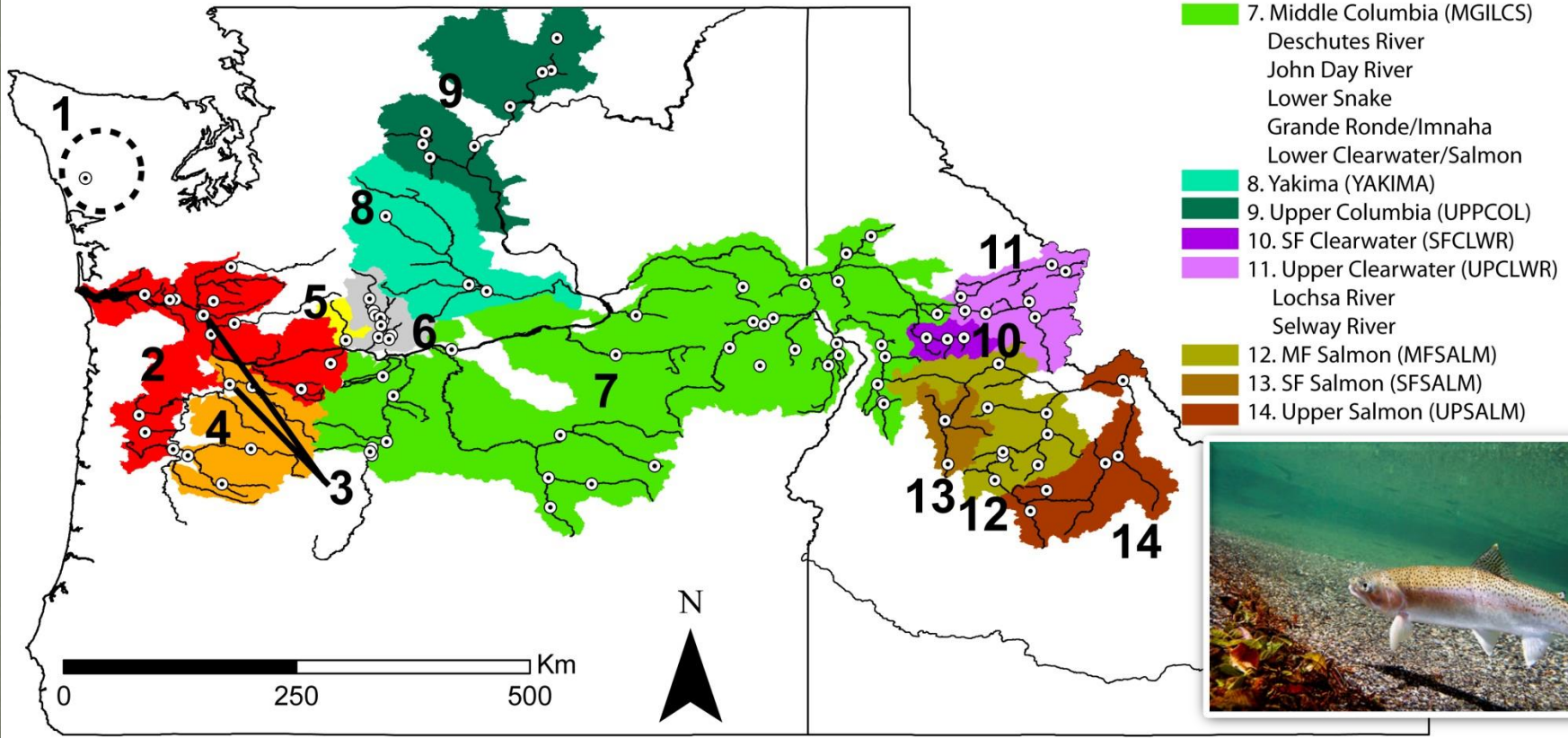
Genetic tools- GSI

Steelhead GSI baseline

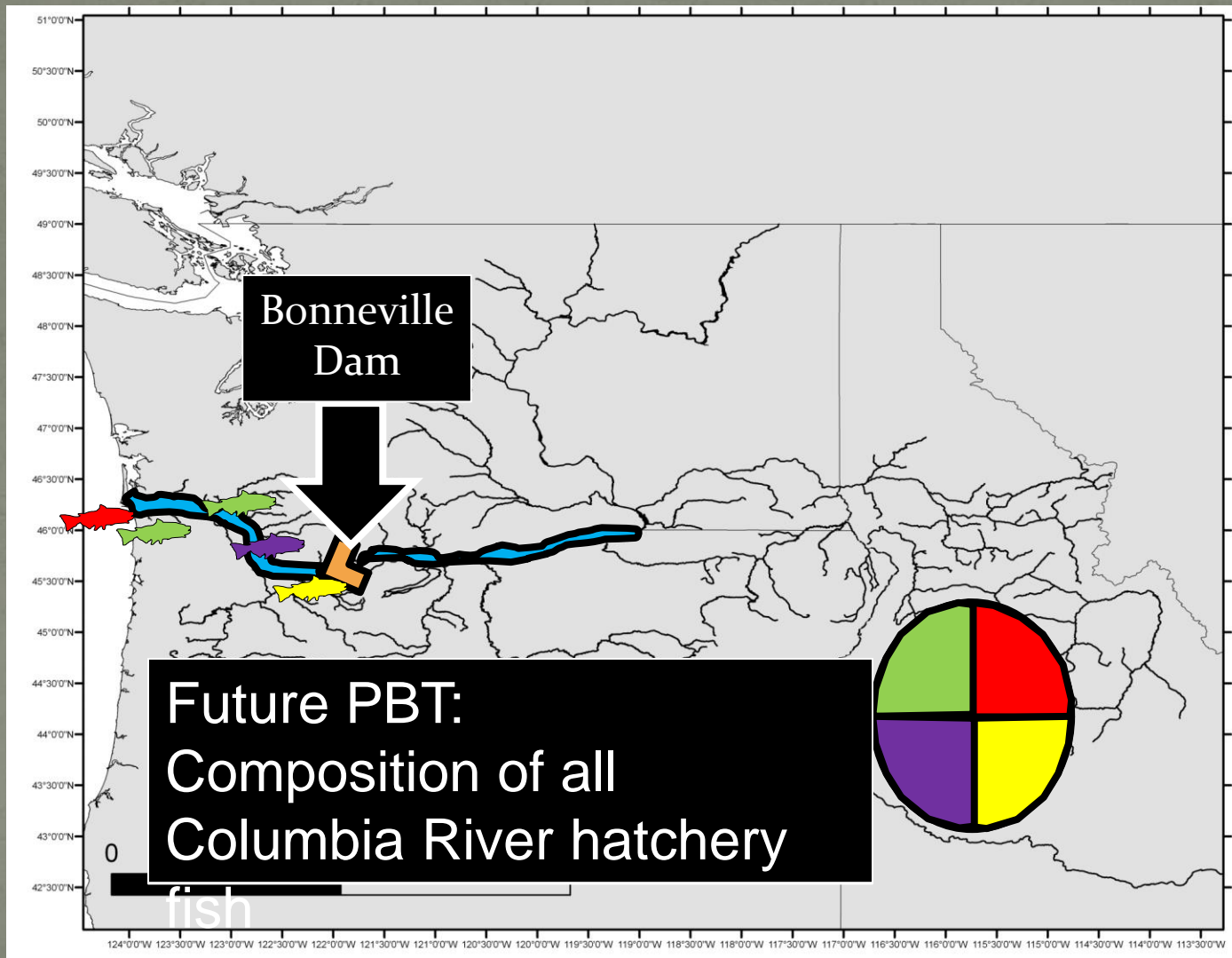
180 SNP loci

14 Reporting Groups; 131+ Collections

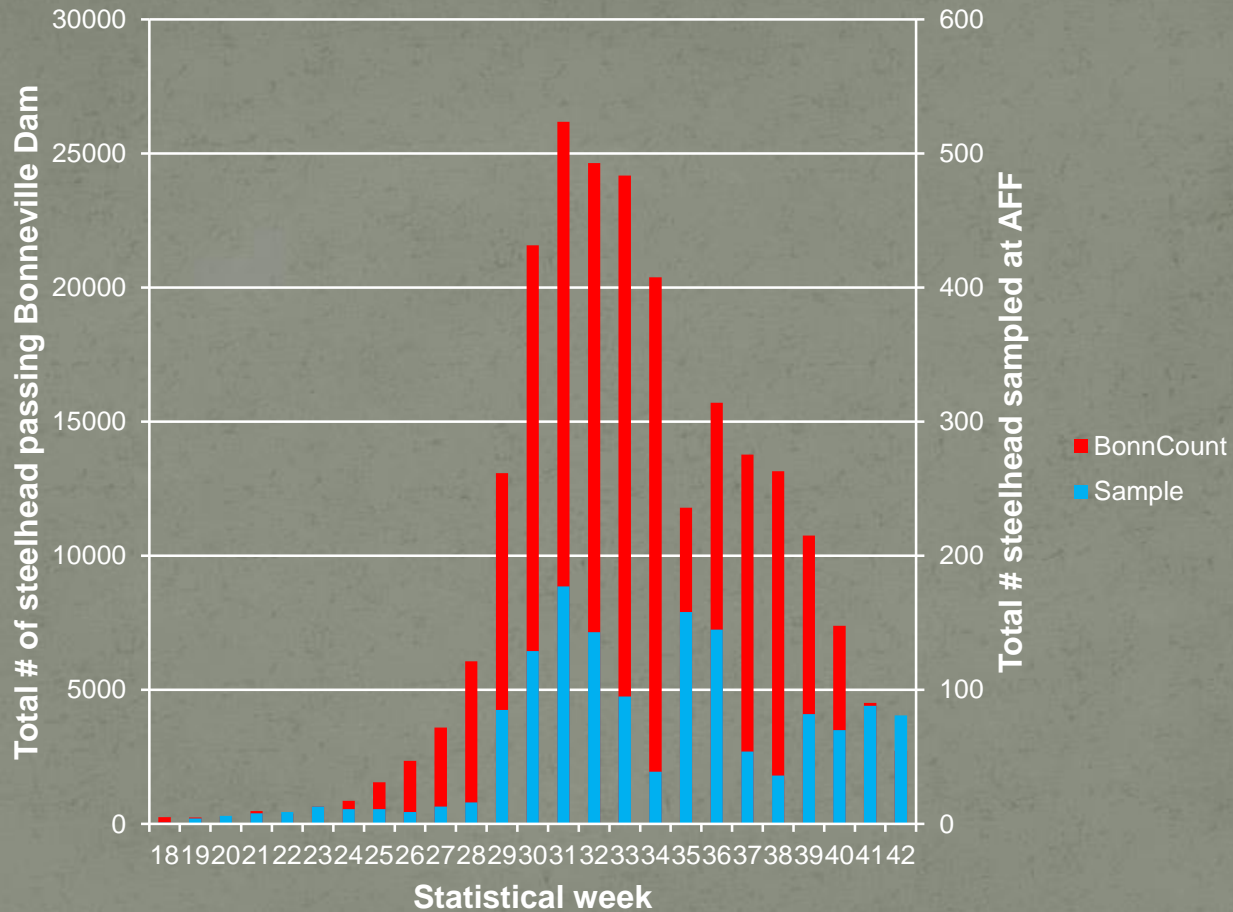
8000+ Individuals



Application of genetic tools in monitoring programs

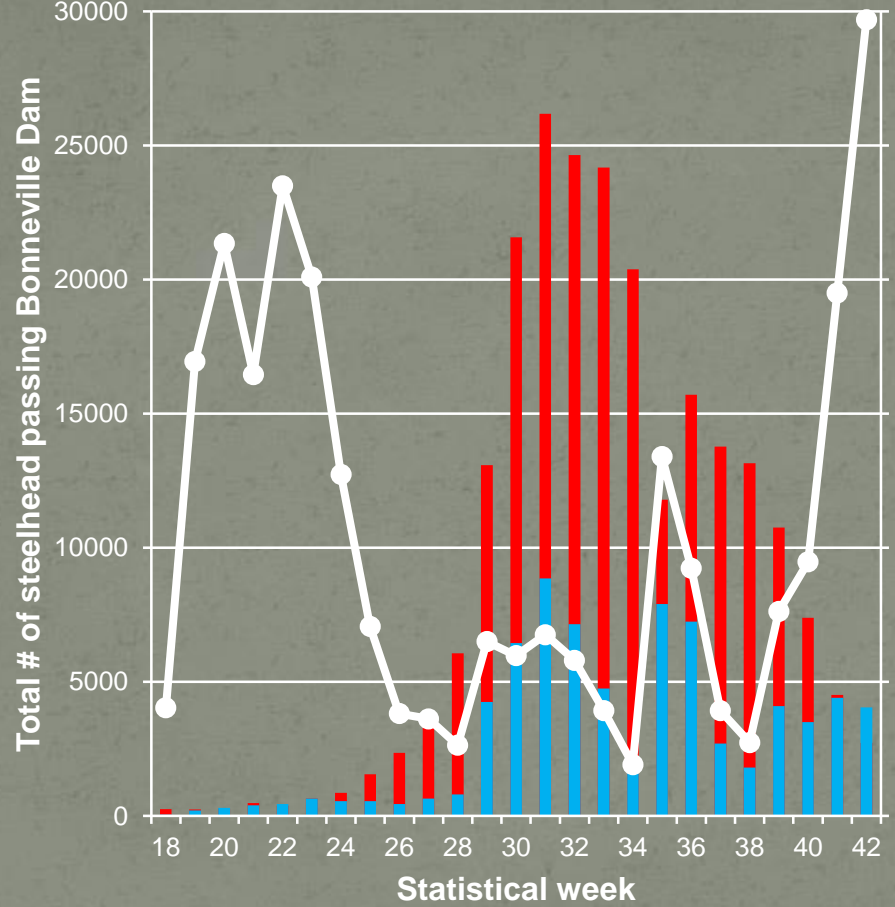
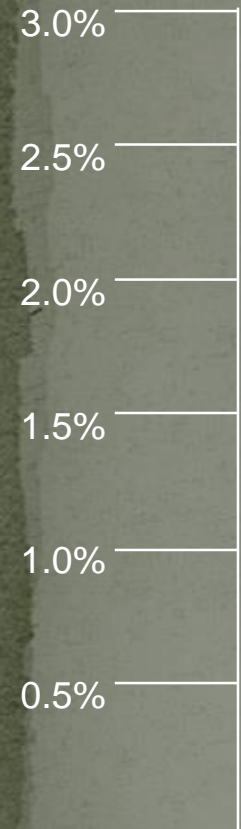


Steelhead counts at Bonneville Dam and sample strata



Steelhead counts at Bonneville Dam and sample strata

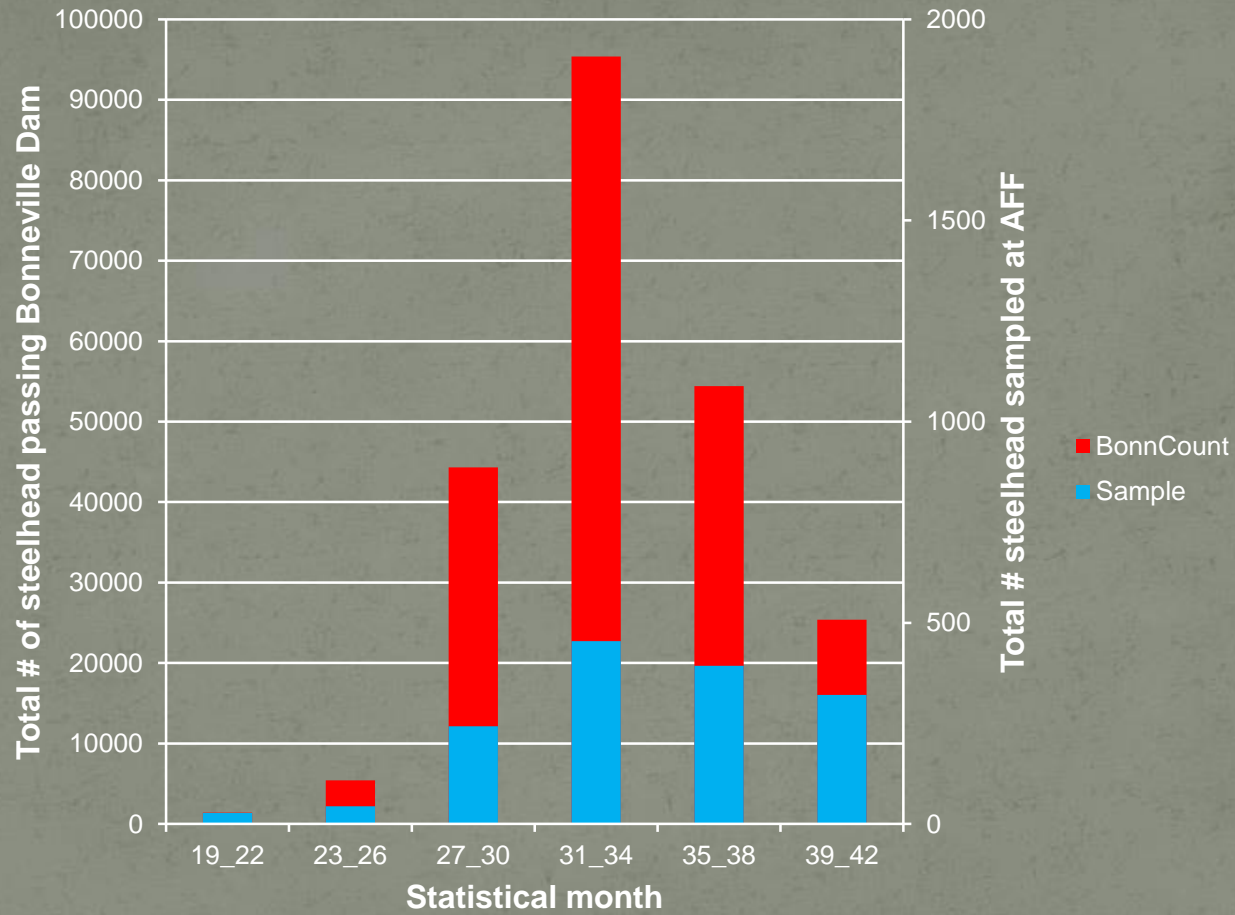
Sample rate



- BonnCount
- Sample
- samplerate

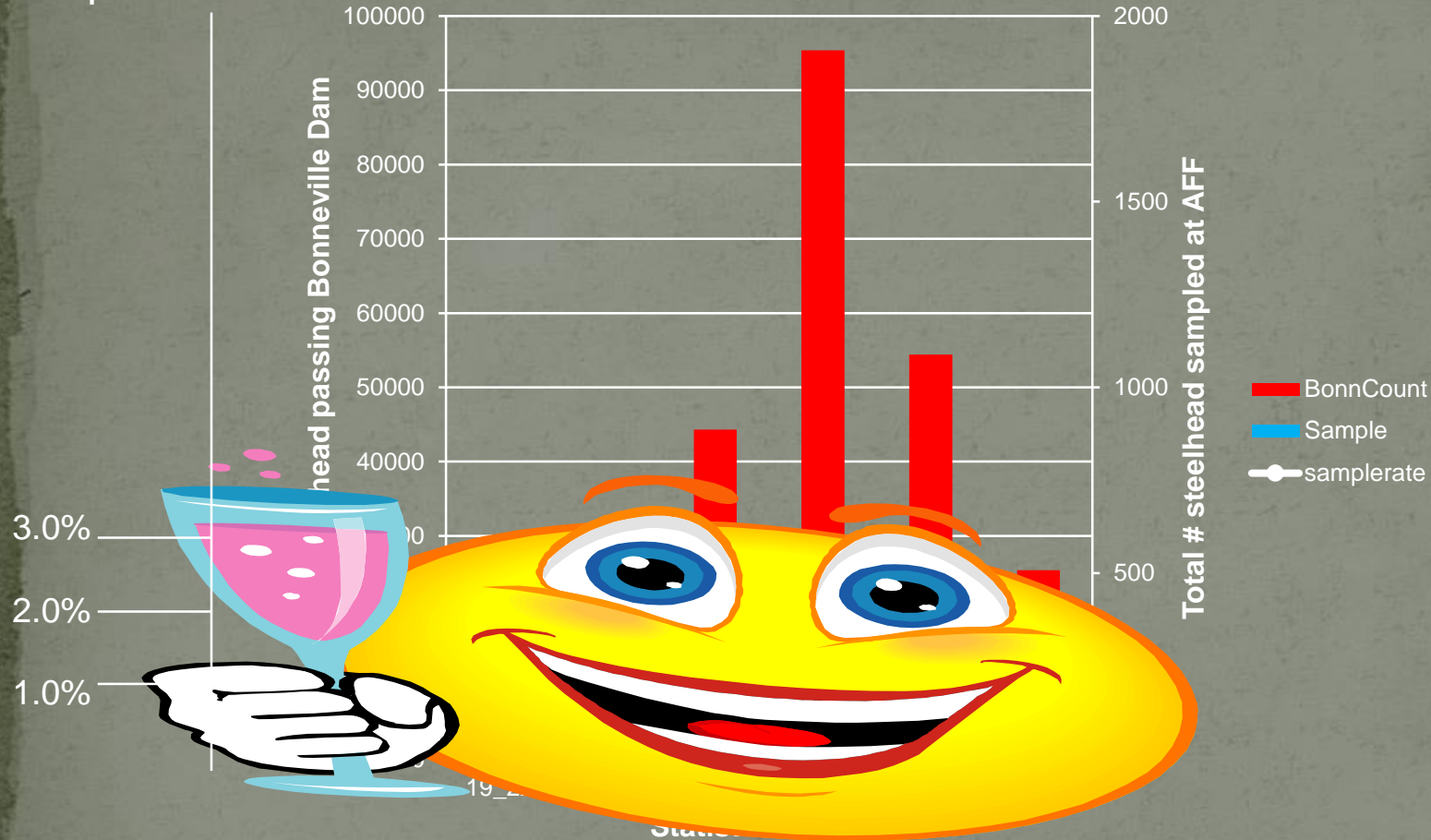
Statistical week	Total # of steelhead passing Bonneville Dam	Total # steelhead sampled at AFF	Sample rate
18	100	10	0.004
19	100	10	0.017
20	100	10	0.021
21	100	10	0.016
22	100	10	0.023
23	100	10	0.020
24	100	10	0.013
25	100	10	0.007
26	100	10	0.004
27	100	10	0.004
28	100	10	0.003
29	100	10	0.006
30	100	10	0.006
31	100	10	0.006
32	100	10	0.006
33	100	10	0.005
34	100	10	0.004
35	100	10	0.002
36	100	10	0.013
37	100	10	0.009
38	100	10	0.004
39	100	10	0.003
40	100	10	0.007
41	100	10	0.009
42	100	10	0.029

Steelhead counts at Bonneville Dam and sample strata



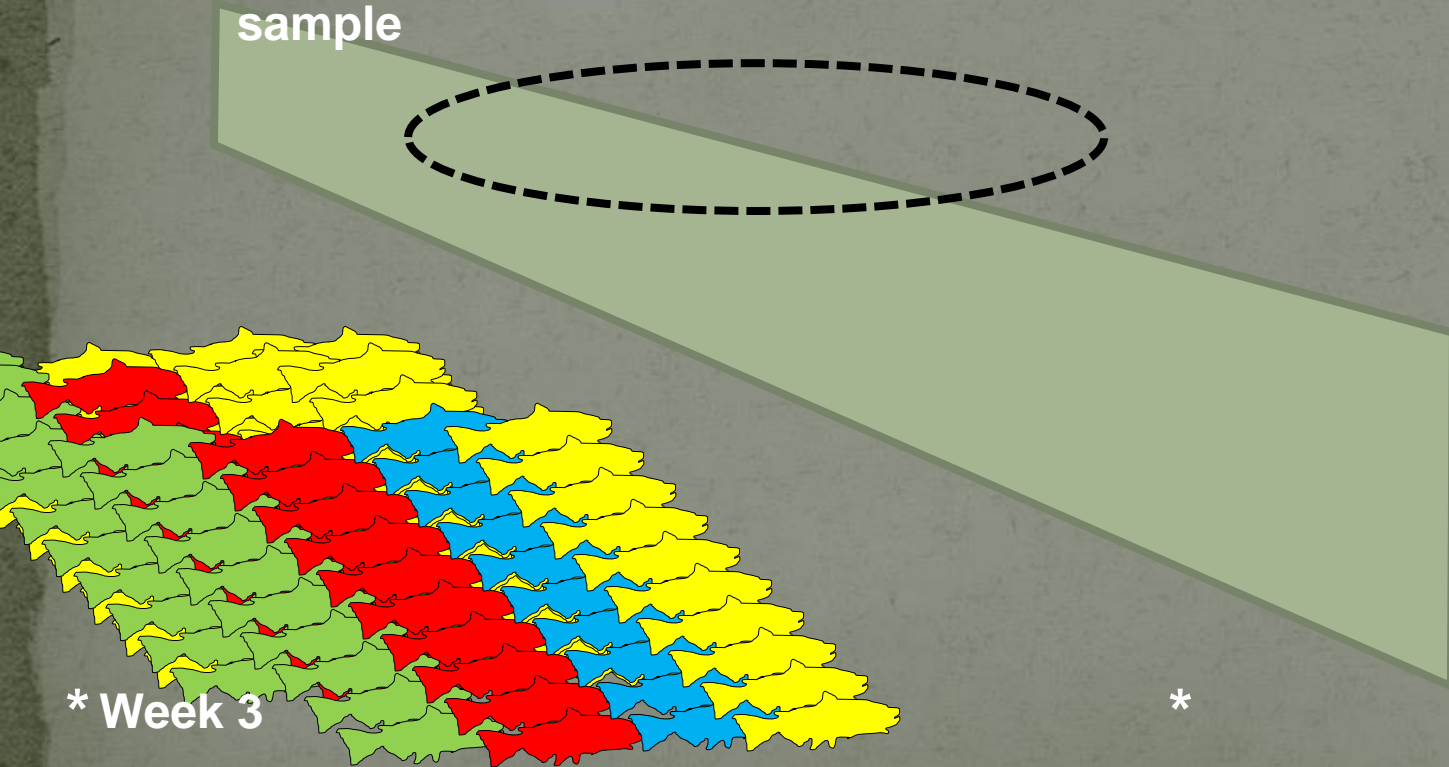
Steelhead counts at Bonneville Dam and sample strata

Sample rate



Sampling and abundance expansion

Bonneville Dam
sample

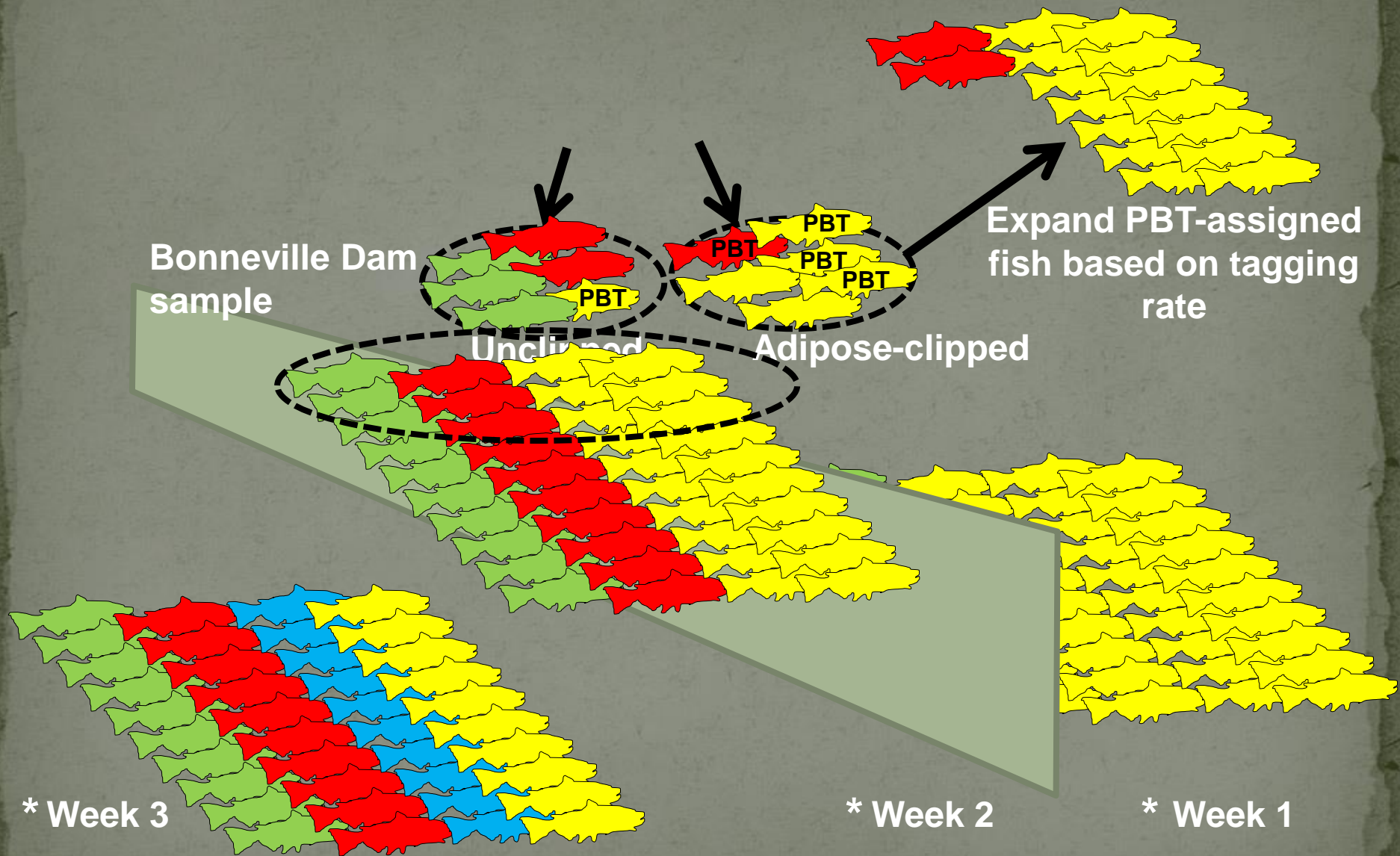


* Week 3

Week 1

* Steelhead were pooled into months due to low sample size

Sampling and abundance expansion



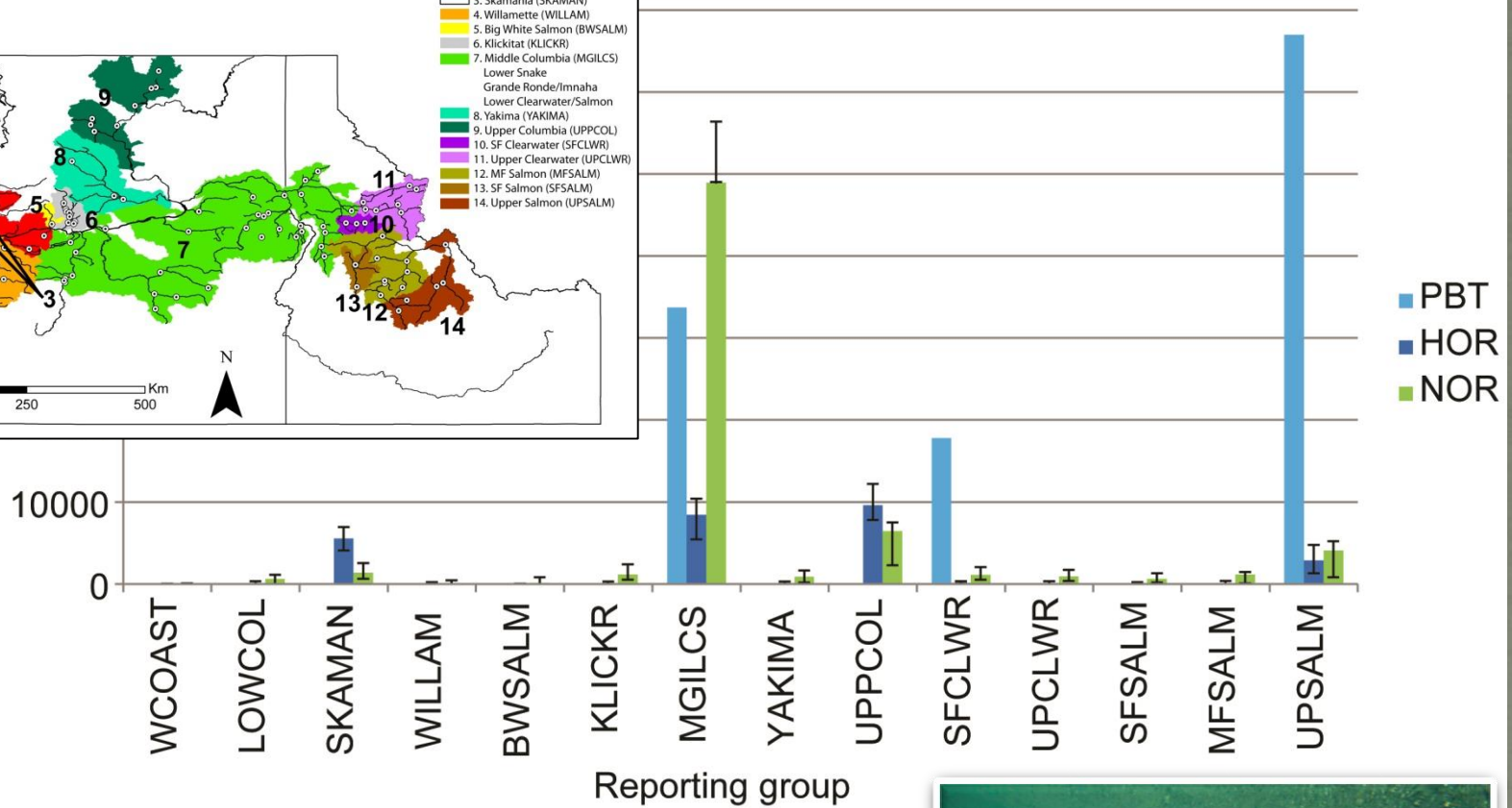
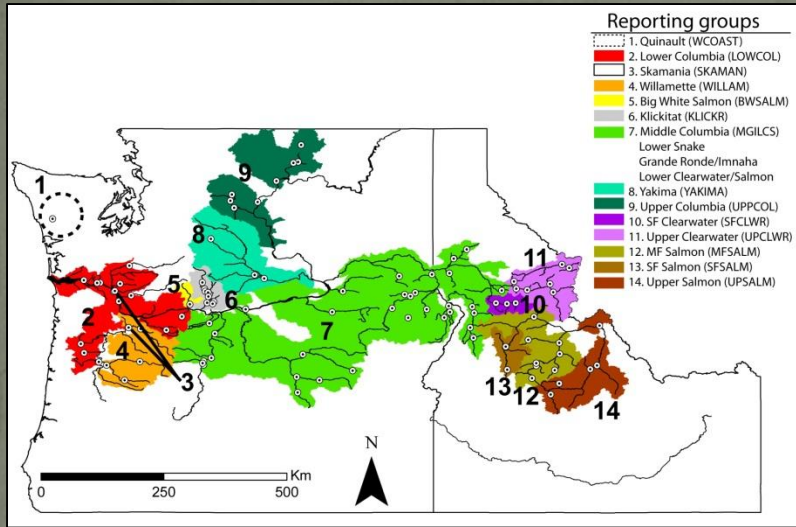
* Week 3

* Week 2

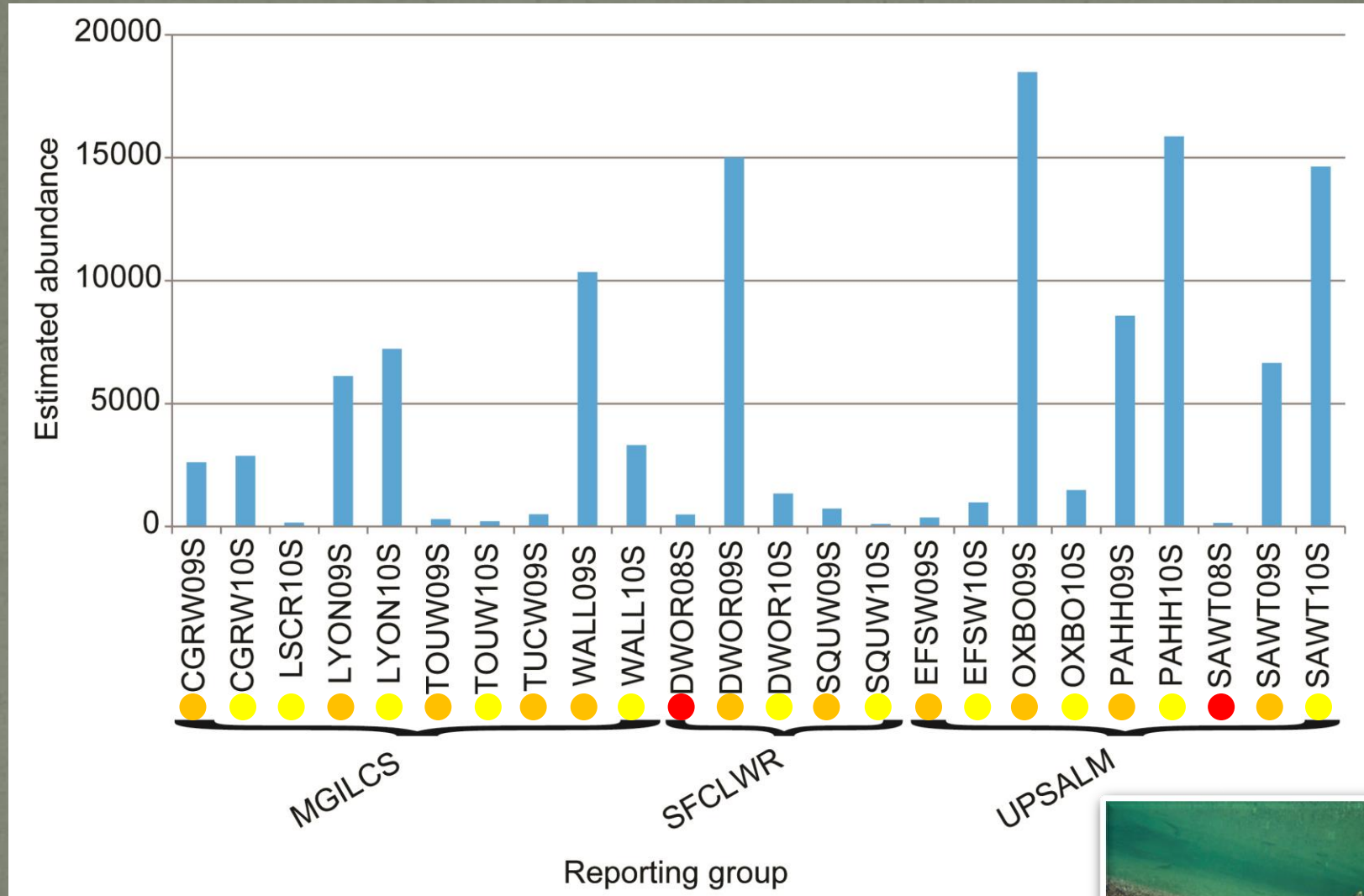
* Week 1

* Steelhead were pooled into months due to low sample size

Steelhead stock abundance estimates



Steelhead PBT hatchery abundance estimates

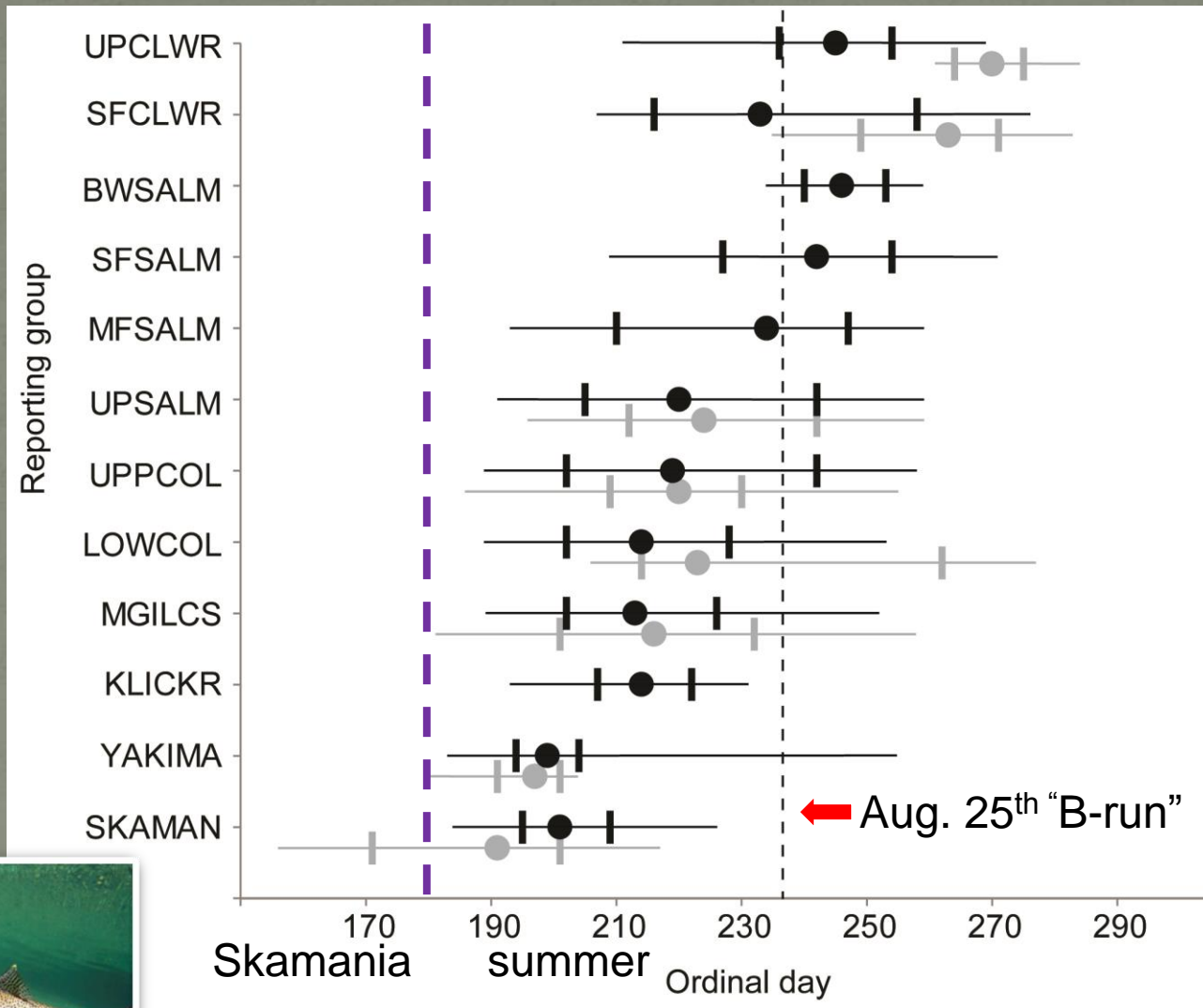


● 1-ocean
"A-run"

● 2-ocean
● 3-ocean
"B-run"

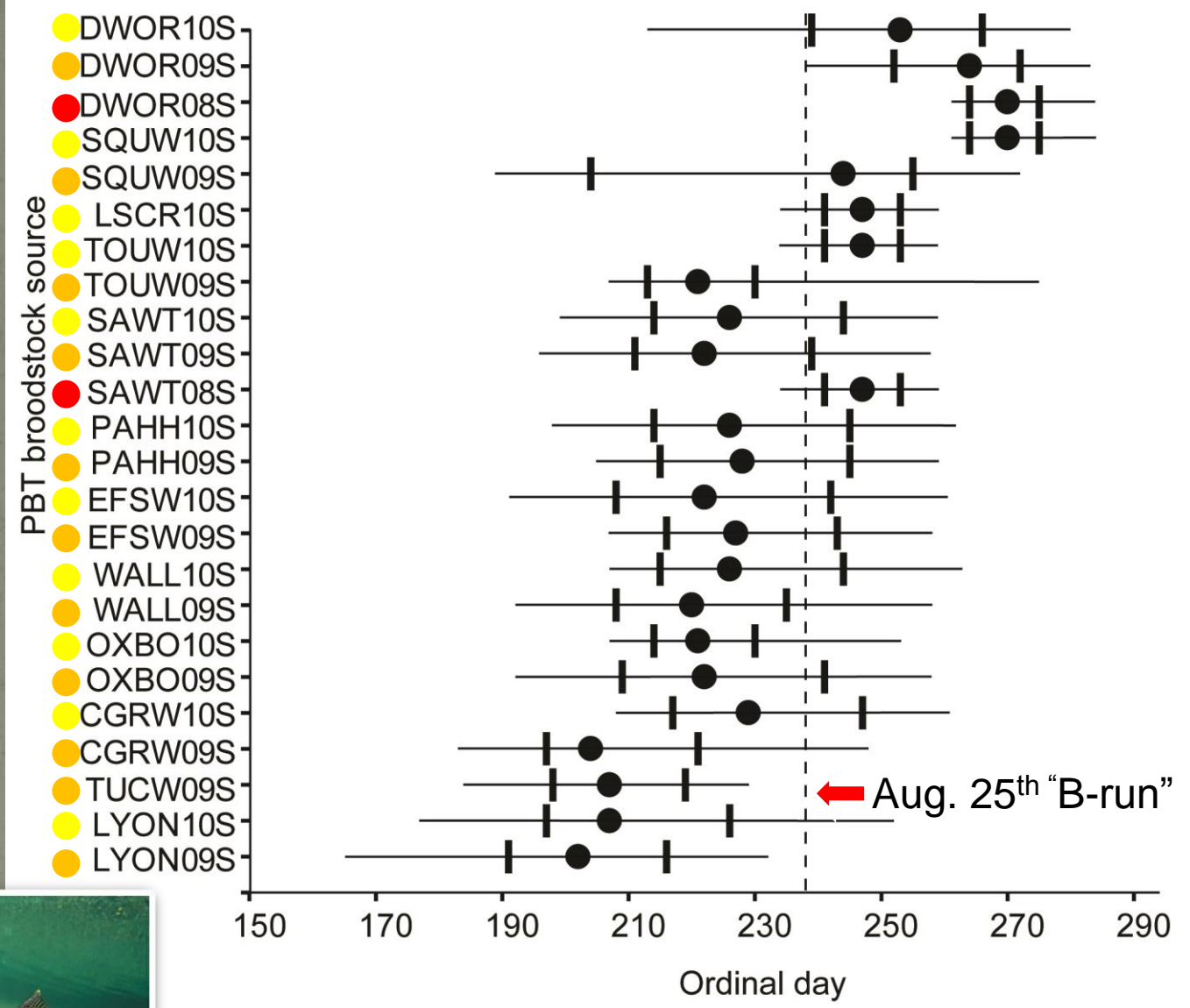


Run-timing of steelhead hatchery- and natural-origin stocks



○ hatchery-origin ● natural-origin

Run-timing of steelhead PBT hatchery stocks

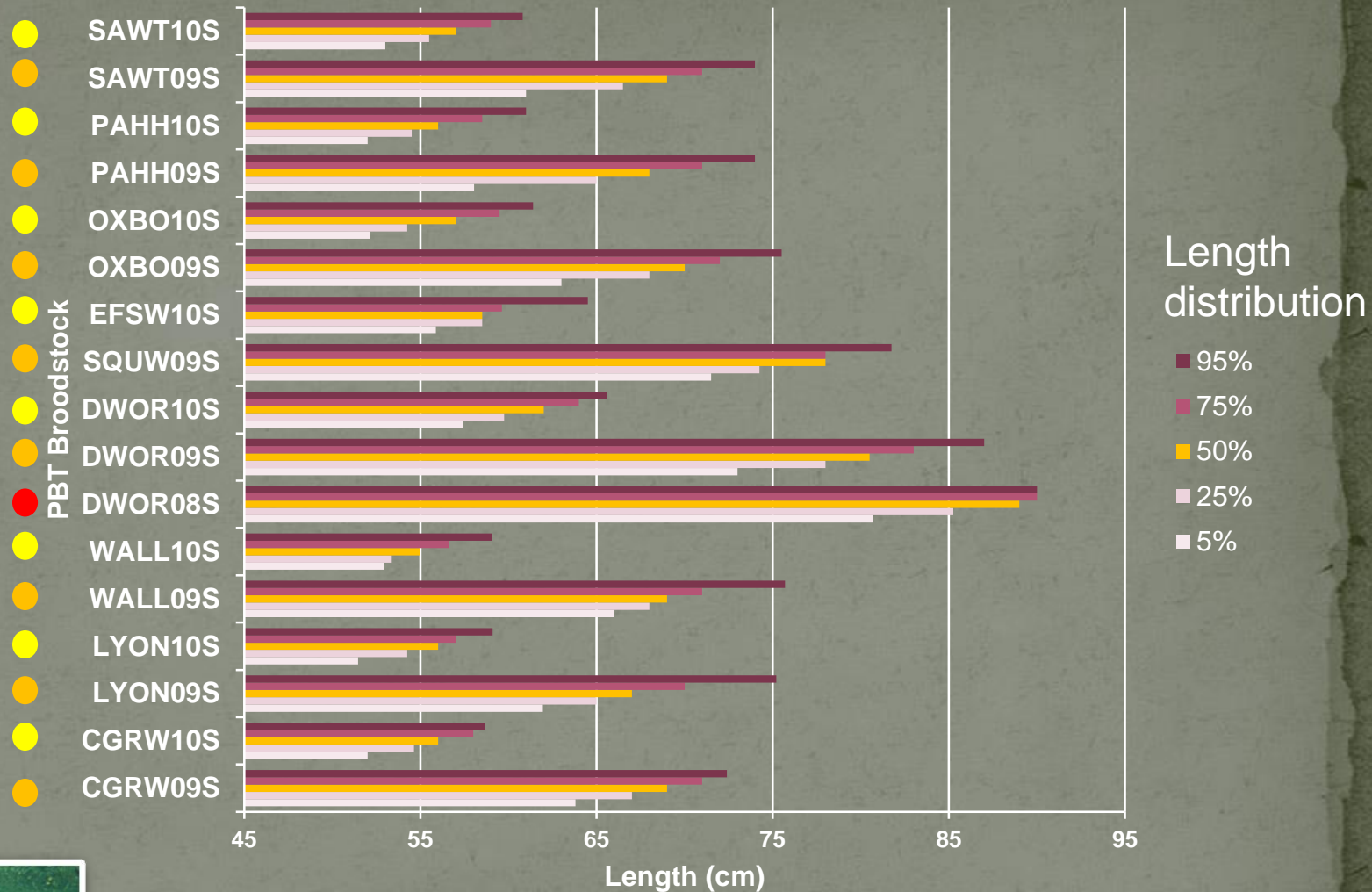


1-ocean

2-ocean

3-ocean

Length of steelhead PBT hatchery stocks

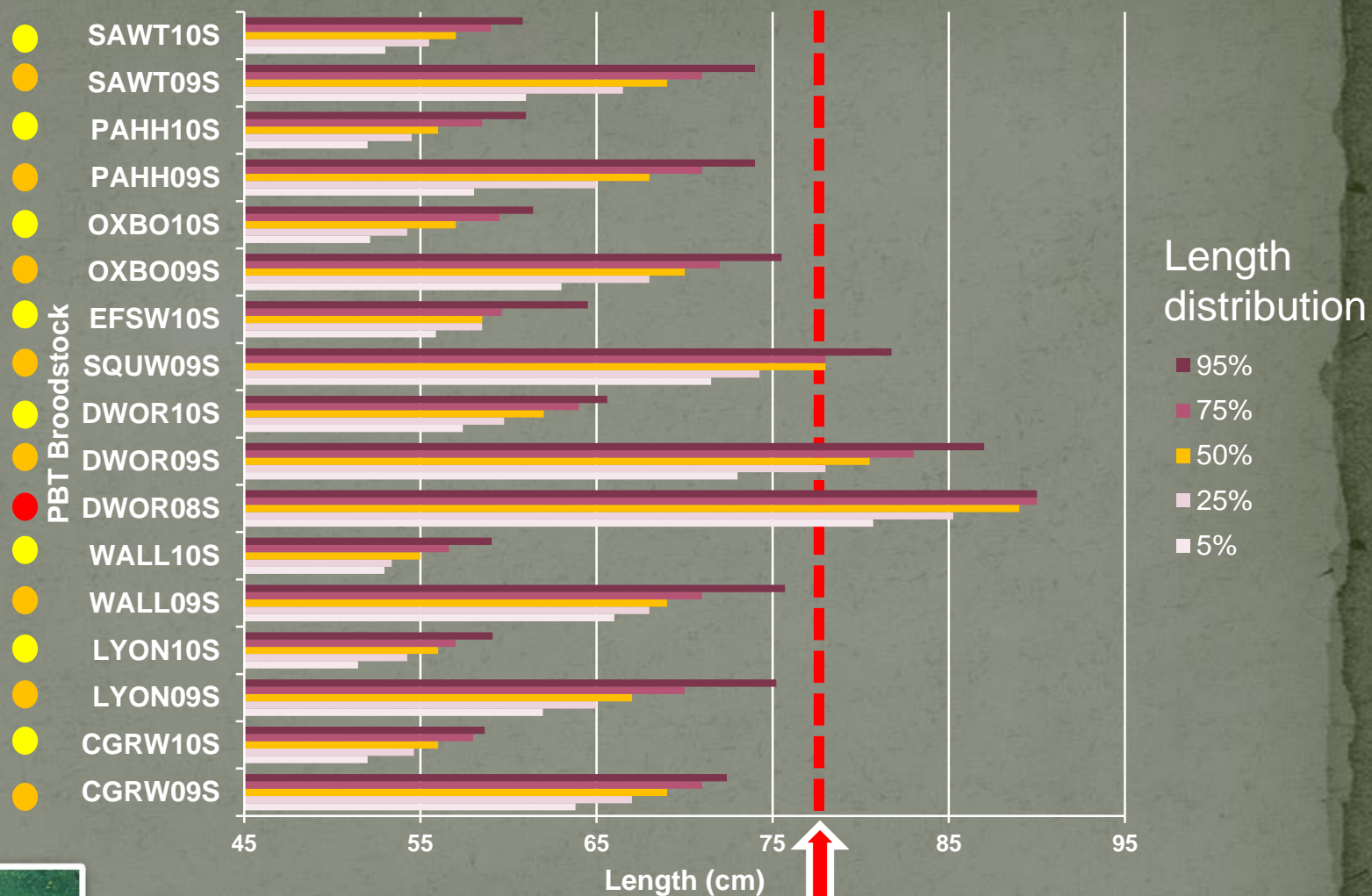


1-ocean

2-ocean

3-ocean

Length of steelhead PBT hatchery stocks



>78 cm "B-run"

1-ocean

2-ocean

3-ocean



Concluding remarks

- PBT baseline for steelhead has expanded to include all hatcheries above Bonneville Dam (SY2012).
- Combining GSI and PBT provides a complete analysis on all hatchery- and natural-origin stocks.
- Possible to characterize age-classes within hatchery stocks.
- Abundance and run-timing data at Bonneville Dam will provide context for fisheries managed in the Columbia R. mainstem.



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Power analysis of steelhead GSI baseline

Reporting group	Leave-1-out	100%Sims
WCOAST	100.0%	100.0%
LOWCOL	87.8%	97.3%
SKAMAN	80.5%	97.2%
WILLAM	86.4%	99.4%
BWSALM	90.5%	100.0%
KLICKR	77.2%	99.3%
MGILCS	85.4%	96.5%
YAKIMA	80.4%	97.6%
UPPCOL	62.9%	91.1%
SFCLWR	83.0%	95.7%
UPCLWR	93.9%	99.1%
SFSALM	89.5%	99.1%
MFSALM	91.0%	97.6%
UPSALM	61.0%	93.7%
Grand Total	83.4%	96.9%